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163. Proposed by R. D. CARMICHAEL, Anniston, Ala.

In a regular n-gon a triangle is formed by taking three vertices at random. What is the mean value of the triangle?

No solution has been received.

164. Proposed by J. O. MAHONEY, B. E., M. Sc., Central High School, Dallas, Tex.

If m is prime, and the numbers 0, 1, 2, ..., m^2-1 are placed at random in the form of a square, the probability that the square is hyper-magic is $(m-1)m/(m^2-2)!$

No solution has been received.

167. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

A line l is divided into n segments by $n-1$ points taken at random on it; find the mean value of the product of p of the segments, the p segments being taken at random and p being less than n.

Solution by the PROPOSER.

Let a, b, c, ... be the p segments in some particular case. The chance that another point taken at random shall fall on the first of these segments is a/l; on the second, b/l; and so on. Hence the chance in this particular case that p new points taken at random will fall each on one of the p segments a, b, c, ... in an assigned order is $abc.../l^p$. The chance that they shall so fall in any order is evidently $p!abc.../l^p$. Hence the probability of this occurring, however the line is divided and however the p points are chosen, is $p!m(abc...)/l^p$.

If now we can find another expression involving no unknown quantity and giving this same probability, the two will enable us to determine the value of $m(abc...)$.

The number of ways in which p points can be taken one on each of p chosen segments is the same as the number of ways in which $p-1$ points can be placed one between the two of each consecutive pair of p other points, and is easily found by the theory of permutations to be $p!(p-1)!$. But p segments may be chosen from n segments in $\frac{n!}{p!(n-p)!}$ ways. Hence the whole number of ways in which p points can be chosen on n segments one on each of p segments is

$$\frac{p!(p-1)!\,n!}{p!(n-p)!}=\frac{n!(p-1)!}{(n-p)!}.$$

Now the whole number of ways in which $n-1+p$ points can be arranged is $(n+p-1)!$. Hence the chance that no two of the p points last chosen shall be on the same one of the original n segments is

$$\frac{n!(p-1)!}{(n-p)!}\div(n+p-1)!=\frac{n!(p-1)!}{(n-p)!(n+p-1)!}.$$